

We claim:

1. A method of making a composite article having large scale predictable dimensional stability, said method comprising:

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a. depositing a layer of a radiation curable composition onto one surface of a radiation transmissive metal foil backing to provide a layer having an exposed surface;

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b. contacting a master with a preformed surface bearing a pattern capable of imparting a three-dimensional microstructure of precisely shaped and located functional discontinuities including distal surface portions and adjacent depressed surface portions into the exposed surface of the layer of radiation curable composition on said metal foil backing under sufficient contact pressure to impart said pattern into said layer;

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c. while the layer of radiation curable composition is in contact with the patterned surface of the master, exposing said curable composition to a sufficient level of radiation through the metal foil backing to cure said composition to provide a cured polymer which adheres to the metal foil backing; and

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d. separating the cured polymer layer on the metal foil backing from the surface of the master.

25 2. The method of claim 1 wherein said radiation curable composition is a curable oligomeric composition.

3. The method of claim 1 wherein after such contact at least one portion of the polymer layer will include a distal surface portion distally spaced at least 0.05 mm from an adjacent depressed surface portion.

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4. A method of claim 1 wherein said metal foil backing comprises a metal selected from the group consisting of copper, aluminum, zinc, titanium, tin, iron, nickel, gold, silver, combinations thereof and alloys thereof.

5 5. A method of making a composite article having large scale predictable dimensional stability, said method comprising:

a. depositing a layer of a radiation curable composition onto one surface of a metal foil backing to provide a layer having an exposed surface;

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b. contacting a radiation transmissive master with a preformed surface bearing a pattern capable of imparting a three-dimensional microstructure of precisely shaped and located functional discontinuities including distal surface portions and adjacent depressed surface portions into the exposed surface of the layer of radiation curable composition on said metal foil backing under sufficient contact pressure to impart said pattern into said layer;

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c. while the layer of radiation curable composition is in contact with the patterned surface of the master, exposing said composition to a sufficient level of radiation through the master to cure said composition to provide a cured polymer which adheres to the metal foil backing; and

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d. separating the cured polymer layer on the metal foil backing from the surface of the master.

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6. The method of claim 5 wherein said radiation curable composition is a curable oligomeric composition.

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7. The method of claim 5 wherein after such contact at least one portion of the polymer layer will include a distal surface portion distally spaced at least 0.05 mm from an adjacent depressed surface portion.

8. The method of claim 5 wherein said metal foil backing comprises a metal selected from the group consisting of copper, aluminum, zinc, titanium, tin, iron, nickel, gold, silver, combinations thereof and alloys thereof.

5 9. The method of claim 1 wherein said radiation is e-beam radiation.

10. The method of claim 1 wherein said radiation is thermal radiation.

11. The method of claim 5 wherein said radiation is actinic radiation.

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12. The method of claim 5 wherein said radiation is thermal radiation.

13. The method of claim 5 wherein said radiation is e-beam radiation.

15 14. A composite article having large scale predictable dimensional stability comprising:

a. a metal foil backing having a back surface and an opposite front surface; and

20 b. a layer of a radiation cured polymer having an exposed front surface bearing a three-dimensional microstructure of precisely shaped and located functional discontinuities including distal surface portions and adjacent depressed surface portions and an opposite surface in adherent contact with the front surface of said backing.

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15. The composite article of claim 14 wherein said metal foil backing comprises a metal selected from the group consisting of copper, aluminum, zinc, titanium, tin, iron, nickel, gold, silver, combinations thereof and alloys thereof.

30 16. The composite article of claim 14 wherein said radiation cured polymer is a cured oligomeric resin.

17. The composite article of claim 14 wherein said radiation cured polymer is cured by electron beam radiation and said metal foil backing is e-beam radiation transmissive.

5 18. The composite article of claim 14 wherein said radiation cured polymer is cured by actinic radiation.

10 19. The composite article of claim 14 wherein said radiation cured polymer is cured by thermal radiation.

20. The composite article of claim 14 wherein the depressed areas are wells which are shaped for receiving and holding complementarily shaped articles.

15 21. The composite article of claim 20 in which the cavities are shaped to receive gyricon spheres.

22. The composite article of claim 15 wherein the metal foil comprises a metal selected from the group consisting of copper and aluminum.

20 23. The composite article of claim 20 in which the cavities are shaped to receive conductive spheroids.

25 24. A method of making a composite article having large scale predictable dimensional stability, said method comprising:

a. depositing a layer of a radiation curable composition onto one surface of a radiation transmissive metal foil backing to provide a layer having an exposed surface;

30 b. contacting a master with a preformed surface bearing a pattern capable of imparting a three-dimensional microstructure of precisely shaped and located

interactive functional discontinuities including distal surface portions and adjacent depressed surface portions into the exposed surface of the layer of radiation curable composition on said metal foil backing under sufficient contact pressure to impart said pattern into said layer;

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c. while the layer of radiation curable composition is in contact with the patterned surface of the master, exposing said curable composition to a sufficient level of radiation through the metal foil backing to cure said composition to provide a cured polymer which adheres to the metal foil backing; and

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d. separating the cured polymer layer on the metal foil backing from the surface of the master.

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25. A method of claim 24 wherein said radiation curable composition is a curable oligomeric composition.

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26. A method of claim 24 wherein said metal foil backing comprises a metal selected from the group consisting of copper, aluminum, zinc, titanium, tin, iron, nickel, gold, silver, combinations thereof and alloys thereof.

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27. A method of making a composite article having large scale predictable dimensional stability, said method comprising:

a. depositing a layer of a radiation curable composition onto one surface of a metal foil backing to provide a layer having an exposed surface;

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b. contacting a radiation transmissive master with a preformed surface bearing a pattern capable of imparting a three-dimensional microstructure of precisely shaped and located interactive functional discontinuities including distal surface portions and adjacent depressed surface portions into the exposed surface of the

layer of radiation curable composition on said metal foil backing under sufficient contact pressure to impart said pattern into said layer;

5 c. while the layer of radiation curable composition is in contact with the patterned surface of the master, exposing said composition to a sufficient level of radiation through the master to cure said composition to provide a cured polymer which adheres to the metal foil backing; and

10 d. separating the cured polymer layer on the metal foil backing from the surface of the master.

28. A method of claim 27 wherein said radiation curable composition is a curable oligomeric composition.

15 29. A method of claim 27 wherein said metal foil backing comprises a metal selected from the group consisting of copper, aluminum, zinc, titanium, tin, iron, nickel, gold, silver, combinations thereof and alloys thereof.

30. The method of claim 24 wherein said radiation is e-beam radiation.

31. The method of claim 24 wherein said radiation is thermal radiation.

32. The method of claim 27 wherein said radiation is actinic radiation.

25 33. The method of claim 27 wherein said radiation is thermal radiation.

34. The method of claim 27 wherein said radiation is e-beam radiation.

30 35. A composite article having large scale predictable dimensional stability comprising:

a. a metal foil backing having a back surface and an opposite front surface; and

5           b. a layer of a radiation cured polymer having an exposed front surface bearing a three-dimensional microstructure of precisely shaped and located interactive functional discontinuities including distal surface portions and adjacent depressed surface portions and an opposite surface in adherent contact with the front surface of said backing.

10       36. The composite article of claim 14 wherein at least one portion of the polymer layer includes a distal surface portion distally spaced at least 0.05 mm from an adjacent depressed surface portion.

15       37. The composite article of claim 35 wherein said metal foil backing comprises a metal selected from the group consisting of copper, aluminum, zinc, titanium, tin, iron, nickel, gold, silver, combinations thereof and alloys thereof.

      38. The composite article of claim 35 wherein said radiation cured polymer is a cured oligomeric resin.

20       39. The composite article of claim 35 wherein said radiation cured polymer is cured by electron beam radiation and said metal foil backing is e-beam radiation transmissive.

      40. The composite article of claim 35 wherein said radiation cured polymer is cured by actinic radiation.

25       41. The composite article of claim 35 wherein said radiation cured polymer is cured by thermal radiation.

30       42. The composite article of claim 35 wherein the depressed areas are cavities which are shaped for receiving and holding complementarily shaped articles.

43. The composite article of claim 42 in which the cavities are shaped to receive gyrricon spheres.

5 44. The composite article of claim 37 wherein the metal foil comprises a metal selected from the group consisting of copper and aluminum.

45. The composite article of claim 42 in which the cavities are shaped to receive conductive spheroids.

10 46. The composite article of claim 42 wherein the microstructure is shaped to provide an article which is useful as an etch mask.

47. The composite article of claim 14 having a dimensional change of less than about 100 ppm.

15 48. The composite article of claim 14 having a dimensional change of less than about 60 ppm.

20 49. The composite article of claim 35 having a dimensional change of less than about 100 ppm.

50. The composite article of claim 35 having a dimensional change of less than about 60 ppm.

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